ABSTRACT

A process for producing monocrystalline semiconductor layers. In an exemplary embodiment, a graded $Si_{1-x}Ge_x$ (x increases from 0 to y) is deposited on a first silicon substrate, followed by deposition of a relaxed $Si_{1-y}Ge_y$ layer, a thin strained $Si_{1-z}Ge_z$ layer and another relaxed $Si_{1-y}Ge_y$ layer. Hydrogen ions are then introduced into the strained Si_zGe_z layer. The relaxed $Si_{1-y}Ge_y$ layer is bonded to a second oxidized substrate. An annealing treatment splits the bonded pair at the strained Si layer, such that the second relaxed $Si_{1-y}Ge_y$ layer remains on the second substrate. In another exemplary embodiment, a graded $Si_{1-x}Ge_x$ is deposited on a first silicon substrate, where the Ge concentration x is increased from 0 to 1. Then a relaxed GaAs layer is deposited on the relaxed Ge buffer. As the lattice constant of GaAs is close to that of Ge, GaAs has high quality with limited dislocation defects. Hydrogen ions are introduced into the relaxed GaAs layer at the selected depth. The relaxed GaAs layer is bonded to a second oxidized substrate. An annealing treatment splits the bonded pair at the hydrogen ion rich layer, such that the upper portion of relaxed GaAs layer remains on the second substrate.